

# CLAUSOPHYES TROPICA (SIPHONOPHORAE, CALYCOPHORA), A NEW SIPHONOPHORE SPECIES FROM THE TROPICAL ATLANTIC

P. R. Pugh

## ABSTRACT

A new species of siphonophore belonging to the genus *Clausophyes* is described from specimens collected in the tropical Atlantic Ocean. This species is distinguished from others in the genus by the division of the left lateral wing of the hydroecium, in the posterior nectophore, into two distinct flaps. Other differences are tabulated.

Totton (1954: 133), while discussing the species of the siphonophore genus *Clausophyes* (Family Clausophyidae), stated that "In a new species from 'Discovery II' Station 2084, whose description I am unable to complete at the moment, the posterior nectophore is intermediate in size between the smaller *ovata* [= *moserae*] and the very large *galeata*. The right-hand hydroecial fold has a very large flap midway along its length, which I have never seen in *ovata* [= *moserae*] and *galeata*." This material was re-examined during the preparation of the description of *C. laetmata* Pugh and Pagès, 1993 (Pugh and Pagès, 1993), and indeed was found to be novel. As the material is in quite good condition, it is somewhat surprising that Totton did not describe it more fully. Possibly, and sensibly, he preferred to await the discovery of further material to verify the details. Such material has been found in recent DISCOVERY collections from the tropical Atlantic Ocean, and it is possible now to give a full description of the anterior and posterior nectophores.

## *Clausophyes tropica* new species

### Figures 1 and 2

**Material Examined.**—In recent DISCOVERY collections 180 anterior and 171 posterior nectophores of this new *Clausophyes* species have been found (Table 1). All this material was collected using an RMT8 net (mesh size 4.5 mm), either in its single or multiple version. In several cases, the anterior and posterior nectophores remain attached to each other, and so there can be no doubt of their association. The best of these attached pairs, from DISCOVERY St. 8556#3 (Table 1 for details), is designated the holotype, and is housed in the Natural History Museum, London; Regd. No. 1995.17. Totton's material, which consists of one anterior and one posterior nectophore, came from DISCOVERY St. 2084, 5-xi-1937, 28°52.9'S 13°20.4'E, TYFB, 1,500–800 m. These nectophores are designated the paratypes. They are also housed in the Natural History Museum, London; Regd. No. 1959.1.1.267.

**Diagnosis.**—Clausophyid siphonophore intermediate in size between *Clausophyes moserae* Margulis, 1988 and *C. galeata* Lens and van Riemsdijk, 1908. The anterior nectophore is smooth and ridgeless, and relatively robust, being thickened with mesogloea. It is more or less pointed apically. The nectosac is relatively small, stretching up to less than half the total height. The lateral radial canals follow the typical *Clausophyes* course. The hydroecium is fairly shallow and extends to a little over half the total height. Within it lies an extensive mesogloea process. The somatocyst extends from the base of the process almost to the apex of the nectophore. It is expanded, to a varying degree, for the quarter of its length below its middle.

The posterior nectophore has a relatively small nectosac, whose lateral radial canals follow the basic *Clausophyes* course. The hydroecium forms a deep dorsal

Table 1. Station data for *Clausophyes tropica* new species (arranged in latitudinal order)

Station	Date	Depth (m)	Position		AN	PN
10523#3	10/5/82	700–800	5°30.2'S	0°30.8'E	12	9
10523#2	10/5/82	600–700	5°26.8'S	0°30.8'E	2	2
10523#17	13/5/82	1090–1205	5°08.3'S	0°29.0'E	8	6
10523#18	13/5/82	1205–1300	5°05.1'S	0°29.5'E	4	5
10523#19	13/5/82	1300–1400	5°01.8'S	0°29.8'E	2	2
10523#8	11/5/82	1400–1600	4°55.8'S	0°26.4'E	1	2
10523#13	12/5/82	995–1100	4°54.1'S	0°23.7'E	11	10
10523#12	12/5/82	895–1100	4°52.5'S	0°27.0'E	17	20
10523#9	11/5/82	1600–1800	4°52.4'S	0°23.9'E		1
10523#11	12/5/82	800–895	4°50.6'S	0°30.2'E	2	3
8556#3	24/7/74	805–900	0°22.0'S	22°04.5'W	2	2
8556#2	24/7/74	905–1000	0°18.5'S	22°12.8'W	4	4
8558#1	25/7/74	700–800	0°09.8'S	22°52.8'W	5	1
8563#1	31/7/74	805–900	2°56.5'N	22°42.6'W	2	3
8563#2	31/7/74	905–1000	3°01.3'N	22°52.0'W	3	5
6662#37	21/2/68	1060–1300	10°34.9'N	19°43.7'W	3	5
6662#36	21/2/68	1520–1900	10°37.7'N	19°46.1'W	4	4
6662#35	20/2/68	1300–1680	10°43.1'N	19°53.9'W	3	3
6662#32	20/2/68	1210–1450	10°45.3'N	19°51.7'W	2	
7824#13	7/3/72	1000–1250	10°45.3'N	20°09.8'W	18	15
7824#14	8/3/72	805–900	10°45.9'N	19°57.3'W	1	
6662#34	20/2/68	900–1040	10°46.3'N	19°57.2'W	4	5
6662#28	19/2/68	1000–1250	10°47.3'N	19°57.7'W	1	
7824#19	8/3/72	1000–1250	10°53.3'N	19°55.7'W	11	7
7824#21	8/3/72	1500–2000	10°56.0'N	19°46.7'W	9	7
7824#36	9/3/72	1250–1500	11°03.3'N	19°48.3'W	13	12
6662#8	15/2/68	910–985	11°08.2'N	19°47.8'W	6	6
7834#2	17/3/72	20–1000	15°40.3'N	26°30.7'W	1	1
7803#11	21/2/72	1250–1500	17°43.4'N	24°58.4'W	7	4
7803#7	20/2/72	1500–2000	17°46.7'N	25°10.8'W	1	3
7803#6	20/2/72	1000–1250	17°49.5'N	25°11.1'W	4	5
7803#13	21/2/72	1250–1500	17°56.2'N	24°58.9'W	6	7
7803#9	20/2/72	1500–2000	17°56.6'N	25°06.4'W	6	6
7803#2	19/2/72	1015–1250	18°06.4'N	25°08.1'W	5	6

hollow, within which the stem is attached, in the upper half of the nectophore. The somatocyst is expanded apically in an irregular fashion. The hydroecial wings have a characteristic arrangement, best typified by the extensive flap in the middle of the left wing that divides it into upper and lower parts.

**Description.**—ANTERIOR NECTOPHORE. The anterior nectophore (Fig. 1A) measures up to 18.25 mm in height and 8.5 mm in width, averaging ca. 16 and 7 mm respectively. It is ridgeless and smooth-walled, and relatively robust, being thickened by mesogloea, such that its depth is approximately 3 mm. It shows a brownish sheen. Apically it is more or less pointed, and the apical half of the nectophore is triangular in shape. The hydroecium extends to a little over half the total height (Fig. 1A). The walls of the hydroecium are thickened with mesogloea, and their ventral edges curve smoothly down to slightly below the level of the nectosac. Their outer margins then curve sharply up and unite on the dorsal side of the ostial opening of the nectosac. Their inner margins run up to join with the baso-ventral margin of the ostial opening. The triangular median mesogloea protuberance is extensive, with the point of attachment of the posterior nectophore lying at its baso-ventral corner. From here the pedicular canal runs dorsad beneath

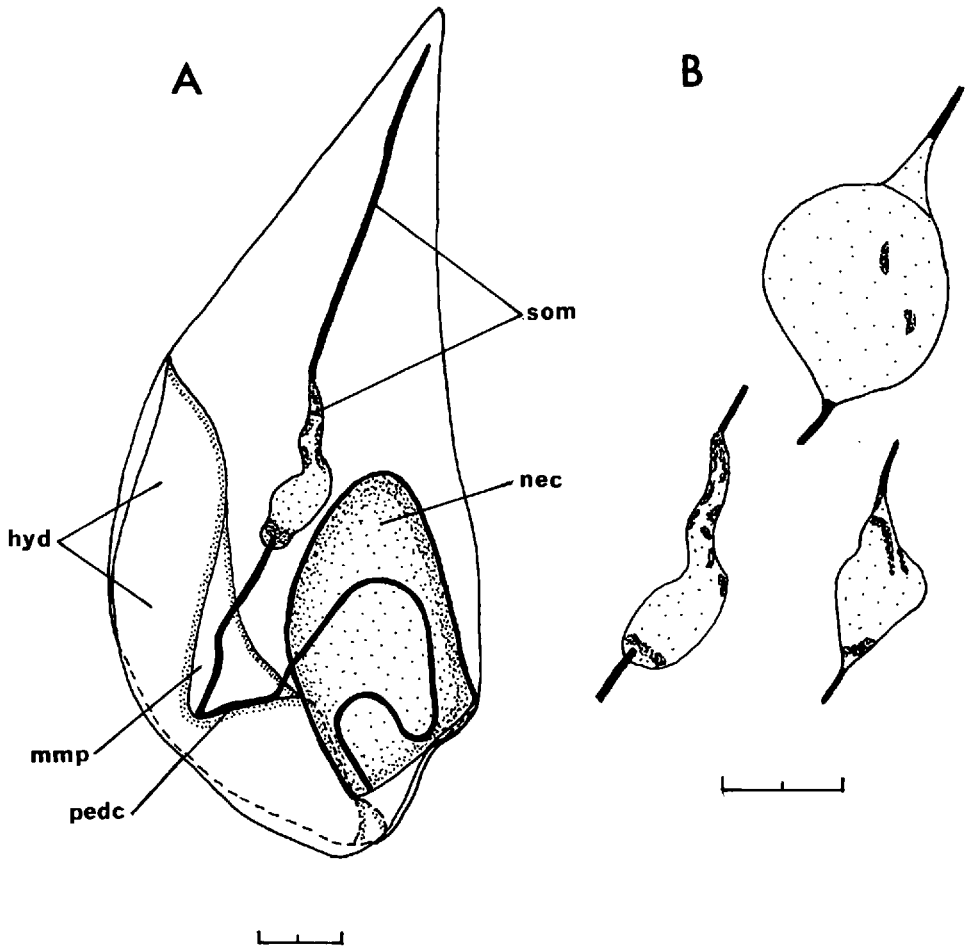


Figure 1. Anterior nectophore of *Clausophyes tropica* new species. A. Lateral view. B. Details showing the variability in the shape of the central part of the somatocyst. Scale = 2 mm. hyd: hydroecium; mmp: median mesogloal protuberance; nec: nectosac; pedc: pedicular canal; som: somatocyst.

its basal surface, in the mid-line. Near the base of the protuberance, this canal bends away from the basal surface and runs up to the nectosac.

The nectosac is relatively small in comparison with other *Clausophyes* species; extending to less than half the height of the nectophore and occupying less than half its width. The pedicular canal joins the nectosac at a point slightly below the mid-height of the latter. There it gives rise to the four radial canals. Because the lining of the nectosac is usually detached, the course of the lateral radial canals often cannot be discerned. However, some specimens, including the holotype, retain parts of the system, and this has allowed a composite picture to emerge (Fig. 1A) that conforms with the basic arrangement found in other *Clausophyes* species.

The somatocyst, for three-quarters of its length, is a simple tube running from the point of attachment of the posterior nectophore up to very close to the apex of the nectophore. However, in the other quarter, below its mid-length, it is swollen to a variable and irregular degree (Fig. 1B). In this region, the somatocyst

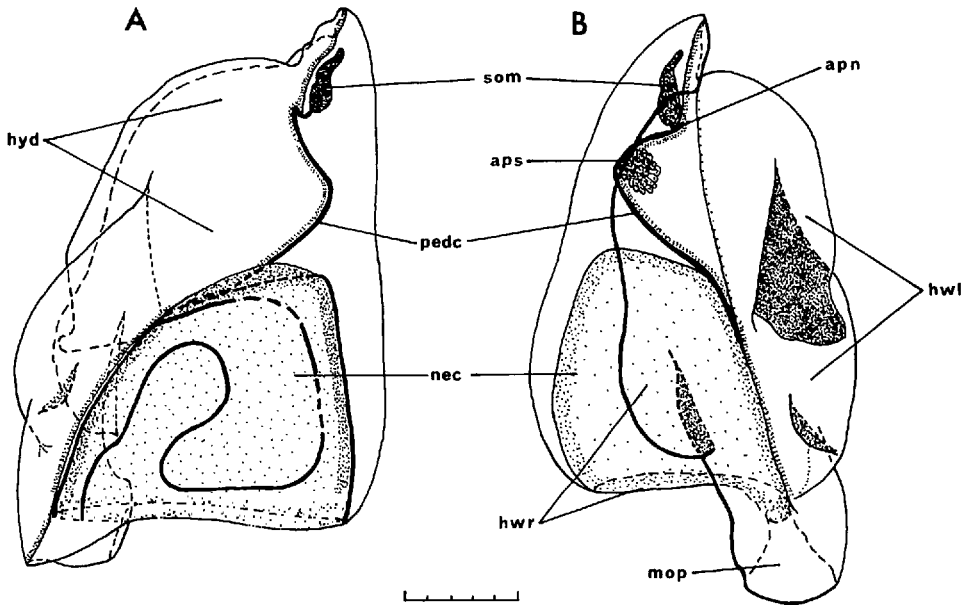


Figure 2. Posterior nectophore of *Clausophyes tropica* new species. A. Lateral view. B. Lateral view, with right hydroecial wing folded back to expose hydroecium. Scale = 5 mm. apn and aps: attachment points of anterior nectophore and stem, respectively; hwl and hwr: left and right hydroecial wings, respectively; hyd: hydroecium; mop: mouth plate; nec: nectosac; pedc: pedicular canal; som: somatocyst.

can appear very diffuse and often its walls are difficult to discern. The variability in its structure is presumed to be related to the nutritive state of the animal.

**POSTERIOR NECTOPHORE.** In general, the posterior nectophore of *Clausophyes tropica* resembles more closely that of *C. galeata* than that of *C. moserae* (see Pugh and Pagès, 1993), being relatively robust and thickened with mesogloea (Fig. 2), and showing a brownish sheen. It measures up to 29.55 mm in height and 18 mm in width, averaging approximately 22.5 and 14 mm respectively. There is a distinct apical process that fits snugly into the upper part of the hydroecium of the anterior nectophore. However, in the preserved material this process often becomes bent over, thereby foreshortening the nectophore. The point of attachment with the anterior nectophore lies on a small median protuberance. From there, the pedicular canal and somatocyst arise. The somatocyst consists of a short canal, generally running dorsad, and a terminal, inflated region, somewhat irregular in shape, directed toward the apex of the nectophore. The pedicular canal runs down beneath the dorsal wall of the hydroecium, in the mid-line, to join the nectosac. As in *C. galeata*, the hydroecium is deeply hollowed, dorsally, in the region above the nectosac. However, this region is more extensive in *C. tropica* as the apex of the nectosac lies at a lower level. Slightly above the mid height of this hollow lies the region of stem attachment.

The nectosac occupies only about half the height of the nectophore, and is more extensive dorsally than ventrally. Its angled apical region, where it lies in close contact with the hydroecium, may be slightly indented in the mid-line, but more usually appears as a broad flattened surface. The radial canal system arises, from the pedicular canal, in the upper half of the nectosac. As in the anterior nectophore, the general loss of the lining of the nectosac means that the course

of the lateral radial canals is difficult to follow. A complete composite picture could not be achieved (Fig. 2A), but sufficient was found to show that it conforms with the general *Clausophyes* pattern. The nectosac has a large ostial opening that is surrounded, basally, by two latero-basal flaps extending from the mouth plate. The mouth plate itself is truncated basally, without any obvious indentations; and flattened both dorsally and ventrally.

The most obvious feature that distinguishes the posterior nectophores of *Clausophyes tropica* from other *Clausophyes* species is the construction of the lateral wings of the hydroecium, particularly that of the left one. It should be noted that the definition of the "right" and "left" side of the posterior nectophore adopted here is based on that used by Bigelow and Sears (1937), and is the opposite of that used by Totton (1954). The arrangement of the hydroecial wings are shown in Figure 2B where the right hydroecial wing has been folded back to expose the hydroecium; except in the upper region where the latter is deeply hollowed. Both wings are extensive and thickened with mesogloea. The expanded portion of the right wing does not extend, basally, as far as the left one. Slightly above the level of the ostial opening of the nectosac, it curves sharply dorsad and ostensibly, on the inner wall of the hydroecial wing, it terminates. However, it is overlain by another flap that runs down the outer wall of the nectophore, from about the mid-height of the nectosac, and continues basad to form the ventro-lateral edge of the mouth plate.

The arrangement of the left (right—according to Totton, 1954) hydroecial wing is even more complex. As Totton (1954) noted, there is a very large flap, on the inner side of the wing, midway along its length. It appears to be formed in a similar way to the one, described above, on the right wing, but is much more extensive. In effect, the expanded part of the right hydroecial wing can be considered to consist of an upper and a lower flap, with the latter overlying the former in the middle region. Basally the lower flap terminates in a similar manner to that described for the left wing, in that it peters out on the ventral side of the nectophore approximately on a level with the ostium. Another edge arises on the outer surface of the flap slightly above this level, and runs down to form the ventro-lateral margin of the mouth plate. Because the mesogloea is much thickened in this region these edges do not overlie in such a way as to form a distinct flap. However, in this region there is also a small flap lying obliquely on the inner surface of the lower flap. This flap has its counterpart on the posterior nectophores (where known) of other *Clausophyes* species.

*Distribution.*—Apart from the specimen mentioned by Totton (1954), all others have been found in DISCOVERY collections from the tropical Atlantic Ocean (Table 1). Unfortunately, there have been no other recent DISCOVERY collections at lower latitudes in the South Atlantic Ocean and so the southerly extent of the distribution of *Clausophyes tropica* cannot be assessed beyond the fact that it has been found off South Africa (Totton, 1954). However, there have been numerous DISCOVERY collections made in the North Atlantic Ocean and these reveal that the most northerly record for *C. tropica* lies in the region of 18°N. The records indicate that *C. tropica* is a meso/bathypelagic species. It has been collected over a wide depth range, from 600 to 2,000 m, with a mean depth of ca. 1,150 m. This depth and latitudinal distribution coincides exactly with the presence of Antarctic Intermediate Water in the tropical part of the North Atlantic (Fasham and Angel, 1975). This being so, then a more widespread distribution in the South Atlantic would be expected.

Table 2. Comparison of the nectophores of *Clausophyes* species

	<i>C. laemata</i>	<i>C. moserae</i>	<i>C. tropica</i>	<i>C. galeata</i>
<b>Anterior nectophore</b>				
Mean height $\times$ width (mm)	up to $9.25 \times 5.25$	$7-8 \times 4$	$16 \times 7$	$16 \times 9.5$
Hydroecium: Total height	$\frac{2}{3}$	ca. $\frac{1}{2}$ , but variable	ca. $\frac{1}{2}$	$\frac{1}{2}-\frac{2}{3}$
Median hydroecial process	Small, in upper $\frac{1}{3}$	Large, central	Pronounced, central	Pronounced, central
Hydroecial flaps	Left and Right	None	None	Basally grooved
Mouth plate	Undivided	Almost completely divided	Completely divided	None
Nectosac*: Total height	$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{8}-\frac{1}{2}$	$\frac{3}{4}$
Pedicular canal insertion: nectosac height	ca. $\frac{1}{2}$	lower $\frac{1}{3}$	ca. $\frac{1}{2}$	$\frac{1}{4}-\frac{1}{3}$
Expanded part of somatocyst	Upper half, irregularly expanded	Central $\frac{1}{3}$ , regularly but variably expanded	From $\frac{1}{4}$ to $\frac{1}{2}$ height, irregularly and variably expanded	Upper half, irregularly expanded
<b>Posterior nectophore</b>				
Mean height $\times$ width (mm)	Not known	$10-11 \times 7.5$	$22.5 \times 14$	$30 \times 17$
<b>Hydroecium</b>				
Dorsal hollow above nectosac	Not known	None	Large and extensive	Large and extensive
Stem attachment point	Not known	At end of pedicular canal	Within dorsal hollow	Within dorsal hollow
Finger shaped processes	Not known	Absent	Absent	Present
Left lateral wing	Not known	Undivided	Divided into flaps	Undivided
Mouth plate	Not known	Undivided	Undivided	Emarginated or toothed
Nectosac†: Total height	Not known	$\frac{3}{4}$	ca. $\frac{1}{2}$	ca. $\frac{3}{4}$
Lateral canals	Not known	Typical	Typical	More complex
Somatocyst	Not known	Simple	Irregular	Very irregular

\* Base of nectophore to apex of nectosac.

† Base of nectosac (excluding mouth plate) to its apex.

*Etymology*.—The name *tropica* refers to the fact that, from our present knowledge, the species has a mainly tropical distribution.

*Remarks*.—The problems with regard to the taxonomy of the Family Clausophyidae and, in particular, the genus *Clausophyes* have been discussed briefly by Pugh and Pagès (1993), and will not be elaborated upon further. With the addition of *C. tropica*, the number of species currently ascribed to the genus *Clausophyes* comes to five. However, Pugh and Pagès (1993) suggested that one of these, *C. ovata* (Keferstein and Ehlers, 1860), may not belong to this genus. Because of this, it will be excluded from further discussion, particularly as it shows clear cut differences from the four other species. In order to distinguish between these four species, their main morphological characteristics are compared to Table 2.

With regard to the anterior nectophore, that of *C. laetmata* easily is distinguished from the other species by the presence of flaps on the hydroecial wings and the complete mouth plate. The smaller size and flimsiness of the anterior nectophore of *C. moserae* should distinguish it from the larger, more robust ones of *C. tropica* and *C. galeata*. However, some larger specimens of *C. moserae* have been found. None the less a combination of several characters, particularly the configuration of the somatocyst, nectosac and mouth plate, should serve to separate the species.

There should be no difficulty in distinguishing the posterior nectophores of the *Clausophyes* species, although that of *C. laetmata* remains unknown. The posterior nectophore of *C. tropica* is set apart, at a glance, by the division of the left hydroecial wing into two flaps. That of *C. galeata* easily is distinguished by the presence of "finger-shaped" processes in the upper part of the hydroecium, in combination with the emarginated or toothed mouth plate. Additionally, this species has a complex lateral radial canal system on the nectosac, but this is not often apparent.

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ADDRESS: Institute of Oceanographic Sciences, Wormley, Godalming, Surrey, GU8 5UB, U.K.